INNOVATION AND DISRUPTION
Automotive Industry Outlook

G. Mustafa Mohatarem,
Chief Economist, General Motors
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Introduction

- Global economic growth has slowed dramatically since the “Great Recession”
- The slowdown has been described by former Treasury Secretary Larry Summers as “secular stagnation”. Christine Lagarde, the Managing Director of the IMF, was even more colorful in her description, calling it the “new mediocre”
- After suffering a sharp contraction during the Great Recession, the U.S. economy has sustained a modest, but steady, pace of economic growth
- But, the current recovery is one of the slowest in the post-WWII U.S. history. Consequently, we have not yet seen the accumulation of excesses and imbalances compared to the peak in previous cycles. Thus, we expect the U.S. economy to continue growing at a modest pace
- The Trump presidency is adding uncertainties to the economic outlook, both on the upside and downside. It is too early to draw definitive conclusions regarding the impact of President Trump’s economic policies
- The Chinese economy has slowed while transitioning from an investment/export growth model to a consumption-based model
- Emerging market economies are especially impacted by China’s slowdown
- Moderate economic expansion in Europe has continued, driven by strong domestic demand
- Political climate in major regions has changed
  - Brexit
  - The election of Donald Trump as President of the U.S.
  - Growth of nationalist movements in many European countries
Auto industry has seemingly decoupled from the global economic malaise

- China had a bumper year in 2016, with sales increasing by more than 3 million units over 2015 to 28.3 million
  - A temporary reduction in the consumption tax and supportive monetary policy contributed to this remarkable performance
- North America also reported a record year, led by strong growth in Mexico
  - The U.S. reported the seventh consecutive year of growth, posting a new record high
  - Canada also reported an all-time high in vehicle sales
- Sales in Western Europe exceeded consensus forecasts
- UK reported an all-time sales record, belying some of the fears about BREXIT
- India continued its steady growth
- Auto sales in Brazil and Russia remain at recessionary levels
  - There are some signs that both countries have reached bottom
- Expect these trends to continue
  - However, another bumper year in China is unlikely given the government’s decision to partially reverse the cut in the consumption tax
Slowest U.S. Recovery Post World War II

- Tepid pace of current recovery minimized imbalances displayed in prior periods
- Leads to expectation that current recovery will continue

Source: Bureau of Economic Analysis; GM calculations
Fiscal policy has been significant drag in this recovery; possible uplift from Trump administration.

Source: Office of Management and Budget
Monetary policy has been supportive

Effective Federal Funds Rate (Pct.)

Note: Shading Indicates recession  Source: Bureau of Economic Analysis; Federal Reserve Board
Oil prices are likely to remain low for longer

WTI (Real, 1985 = 100), USD Per Barrel

Source: Energy Information Administration
Indicators support continued industry strength

Vehicle Sales (Mils. Units)

Source: Bureau of Economic Analysis; GM calculations
Larger vehicles are outperforming

Source: GM Sales Reporting; Data through 2016E
Contrast to popular belief - people are driving much more than before, and younger consumers are becoming a major force in the market.

Source: Federal Highway Administration

Share of Vehicle Sales by Age Group

Source: J.D.Power /PIN, General Motors
Auto sales have reached new record high, expected to remain near record.

Note: Shading indicates recession. Source: Bureau of Economic Analysis.
A Global View
Global economic growth picking up speed

Real GDP Growth (Pct. Chg. YoY)

- World
- Advanced Economies
- Emerging & Developing Economies

Source: IMF
Vehicle sales outside the U.S.

Source: GM Global Reporting
The Top 20 Vehicle Markets Represent 88% of Global Sales

<table>
<thead>
<tr>
<th>Top 20 Vehicle Markets</th>
<th>Millions of New Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2000</td>
</tr>
<tr>
<td>United States</td>
<td>17.814</td>
</tr>
<tr>
<td>Japan</td>
<td>5.970</td>
</tr>
<tr>
<td>Germany</td>
<td>3.694</td>
</tr>
<tr>
<td>Italy</td>
<td>2.692</td>
</tr>
<tr>
<td>France</td>
<td>2.611</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>2.523</td>
</tr>
<tr>
<td>China</td>
<td>2.190</td>
</tr>
<tr>
<td>Spain</td>
<td>1.713</td>
</tr>
<tr>
<td>Canada</td>
<td>1.587</td>
</tr>
<tr>
<td>Brazil</td>
<td>1.459</td>
</tr>
<tr>
<td>South Korea</td>
<td>1.433</td>
</tr>
<tr>
<td>Russia</td>
<td>1.065</td>
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<tr>
<td>Mexico</td>
<td>0.887</td>
</tr>
<tr>
<td>India</td>
<td>0.844</td>
</tr>
<tr>
<td>Australia</td>
<td>0.787</td>
</tr>
<tr>
<td>Netherlands</td>
<td>0.712</td>
</tr>
<tr>
<td>Turkey</td>
<td>0.632</td>
</tr>
<tr>
<td>Belgium/Lux</td>
<td>0.628</td>
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<tr>
<td>Poland</td>
<td>0.520</td>
</tr>
<tr>
<td>Taiwan</td>
<td>0.427</td>
</tr>
<tr>
<td>% of Total</td>
<td>88.0%</td>
</tr>
</tbody>
</table>

Source: GM Global Reporting
Significant Upside Vehicle Ownership Potential for Emerging and Developing Economies

Source: World Bank, Polk, OICA, United Nations, GM calculations
Percentage of households that have a car is the lowest in Asia, Africa, and South America

Source: Poushter, Jacob, Car, bike or motorcycle? Depends on where you live, Pew Research Center, April 16
The Future of Personal Mobility
The Auto Industry Is Undergoing Significant Changes
Four Game Changers

- **CONNECTIVITY**
- **SHARING**
- **ALTERNATIVE PROPULSION**
- **AUTONOMOUS**
The Role of Connectivity in The Future of Personal Mobility

IN 2020
75%

OF OUR
GLOBAL SALES
VOLUME
WILL BE
ACTIVELY CONNECTED
IN SOME WAY
“....THE REAL STORY BEHIND DISRUPTIVE INNOVATION IS NOT ONE OF DESTRUCTION, BUT OF ITS OPPOSITE: IN EVERY INDUSTRY CHANGED BY DISRUPTION, THE NET EFFECT HAS BEEN TOTAL MARKET GROWTH.”
<table>
<thead>
<tr>
<th></th>
<th>High</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diverse mobility</strong></td>
<td></td>
<td></td>
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<tr>
<td>City policies discouraging private vehicles</td>
<td>Intensified</td>
<td>Steady</td>
</tr>
<tr>
<td>New, on-demand business models</td>
<td>Prevalent</td>
<td>Limited</td>
</tr>
<tr>
<td>Modal shift away from car ownership to shared mobility</td>
<td>Significant</td>
<td>Limited</td>
</tr>
<tr>
<td><strong>Autonomous driving</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regulatory challenges are overcome</td>
<td>Fast</td>
<td>Gradual</td>
</tr>
<tr>
<td>Development of safe and reliable technical solutions</td>
<td>Comprehensive</td>
<td>Incomplete</td>
</tr>
<tr>
<td>Consumer acceptance and willingness to pay</td>
<td>Enthusiastic</td>
<td>Limited</td>
</tr>
<tr>
<td><strong>Electrification</strong></td>
<td></td>
<td></td>
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<tr>
<td>Battery prices continue to decline</td>
<td>Rapid</td>
<td>Protracted</td>
</tr>
<tr>
<td>Regulator-driven emission restrictions</td>
<td>Intensified</td>
<td>Gradual</td>
</tr>
<tr>
<td>Consumer demand for electrified powertrains</td>
<td>Widespread</td>
<td>Restrained</td>
</tr>
<tr>
<td><strong>Connectivity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uptake of car connectivity globally</td>
<td>Vast majority</td>
<td>Partial</td>
</tr>
<tr>
<td>Consumers regularly using paid content</td>
<td>Mainstream</td>
<td>Limited</td>
</tr>
</tbody>
</table>

Source: McKinsey
The automotive revenue pool will grow and diversify with new services potentially becoming a ~USD 1.5 trillion market in 2030.

### Traditional Automotive Revenues
- Vehicle sales dominant

### New Automotive Revenues, 2030
- Recurring revenues significantly increasing

#### Recurring Revenues
- Shared mobility penetrates dense and suburban cities with new car sharing and e-hailing business models
- >USD 100 billion from data connectivity services, incl. apps, navigation, entertainment, remote services, and software upgrades

#### Aftermarket
- Growth with increased vehicle sales
- Higher annual maintenance spend for shared vehicles
- 20-30% lower maintenance spend on electric powertrains
- Up to 90% lower average crash repair per autonomous vehicle

#### One-Time Vehicle Sales
- -2% annual global increase in vehicle unit sales driven by macroeconomic growth in emerging economies
- Price premiums paid for electric powertrains and autonomous driving technology features

### Source
- Does not include traditional taxi and rentals
Adoption of autonomous vehicles may occur at significantly different rates across different consumer groups

Insight #6: Adoption Of AVs, SAVs And PSAVs May Occur At Significantly Different Rates Across Different Consumer Groups

**Early Adopters**  
(32% of Consumers)  
- “Stressed Urbanite Vehicle Commuters” (6%)  
- “Suburban Busy Families” (9%)  
- “Fast Followers” (17%)  
  - Younger  
  - More likely to have children in HH  
  - Urban/Suburban  
  - Long commute time/distance  
  - Tech savvy  
  - Use mass transit and ride sharing  
  - Highly educated  
  - High HH income

**Gradual Adopters**  
(35% of Consumers)  
- “Suburban/Rural Traditionalists” (30%)  
- “Non-Owner Shared Adopters” (5%)

**Late Adopters/Resistors**  
(33% of Consumers)  
- “Don’t Need It” (4%)  
- “Set In Their Ways” (22%)  
- “Unattainable & Irrelevant” (7%)  
  - Older  
  - Less likely to have children in HH  
  - Suburban/Rural  
  - Less tech savvy  
  - Low ride sharing use  
  - Lower income  
  - Price sensitive
Our research results show positive responses to autonomous vehicles

- Overall, reactions to autonomous vehicles, both Owned and Shared, were very positive.
- Consumer perceived benefits for autonomous vehicles included:
  - Increased safety.
  - Comfort, convenience, and reduced stress from driving.
  - Regained time and increased productivity.
  - Ability to safely use communication devices and personal electronics while traveling.
- Consumer concerns for autonomous vehicles included:
  - Lack of trust--needs to be proven over time, reliability concerns, fear of giving up control of the vehicle.
  - Liability for malfunctions and accidents.
  - Security concerns regarding being tracked or having their vehicle hacked.
  - Increased maintenance costs & complexity.
  - HMI and uncertainty around how to control the vehicle.
- TRUST in autonomous technology is an important concern that brands/manufacturers need to help build.
  - To help alleviate trust issues, consumers wanted to “try it out” first (e.g. test drives, pay-per-use, etc.).
  - They also want to see others using an autonomous vehicle and want manufacturers to publish / show tests & trials.
Autonomous vehicles (owned or shared) will not derail the growth of auto sales and will unlikely destroy the private ownership model.
Speed of adoption of electric vehicles will vary strongly at the local level

Factors affecting electric vehicle adoption
- Vehicle pricing/affordability
- Range from one charge
- Desirable products
- Charging stations/infrastructures
- Emission/efficiency regulations
Penetration of battery electrified vehicles in global sales

Source: Ward's, ACEA, CAAM, Morgan Stanley Research estimates (from 2017 onwards). Note: Chart shows battery EVs as a % of total new car sales.
Summary

• The Auto Industry is in a sweet spot
• Oil prices are expected to remain low
• Customers have decided to upgrade to crossovers
• Political stresses constitute the biggest risk
• Innovative mobility opportunities are disruptive and yet promising
• Long term demand for vehicles remains very solid